(1) Be able to pass the tests in §160.077–21;

(2) Not present a snag hazard when properly worn;

(3) When worn inflated, have a visible external surface area of at least 1300 sq. cm (200 sq. in.) in front and 450 sq. cm (70 sq. in.) in back that are primarily vivid reddish orange as defined by sections 13 and 14 of the ''Color Names Dictionary'';

(4) Have at least one inflation chamber, except that a hybrid PFD approved as a SOLAS lifejacket must have at least two inflation chambers;

(5) Have at least one manual inflation mechanism.

(6) Have at least one automatic inflation mechanism that inflates at least one chamber; and

(7) Not require second stage donning after inflation.

(8) If approved for adults, be universally sized as specified in §160.077–15(b)(7).

(9) Commercial hybrid PFDs employing closures with less than 1600 N (360 lb) strength, must have at least two closures that meet UL 1517, Section 22.1.

(10) Each commercial hybrid PFD must have an attachment for a PFD light securely fastened to the front shoulder area. The location should be such that if the light is attached it will not damage or impair the performance of the PFD.

(11) In the deflated and the inflated condition, provide buoyancies of at least the values in Table 160.077–17(b)(11).

TABLE 160.077–17(B)(11)—MINIMUM BUOYANCY OF TYPE I AND COMMERCIAL HYBRID PFDS

	Adult	Youth	Small child
Inherent buoyancy (deflated condition):			
Type I	70 N (15.5 lb)	50 N (11 lb)	40 N (9 lb)
Type V	60 N (13 lb)	34 N (7.5 lb)	N/A
Total buoyancy (inflated condition):			
Type I	130 N (30 lb)	80 N (18 lb)	67 N (15 lb)
Type V	100 N (22 lb)	67 N (15 lb)	N/A

[CGD 78–174, 50 FR 33928, Aug. 22, 1985, as amended by CGD 78–174, 60 FR 2487, Jan. 9, 1995]

§160.077–19 Approval Testing—Recreational Hybrid PFD's.

(a) *General.* (1) This section contains approval tests and examinations for recreational hybrid PFD's. Each test and examination must be conducted or supervised by an independent laboratory. The tests must be done using PFD's that have been constructed in accordance with the plans and specifications in the application for approval. In each test only one PFD is required to be tested unless otherwise specified or needed to complete the tests in paragraph (d) of this section.

(2) All data relating to buoyancy and pressure must be taken at, or corrected to, standard atmospheric pressure of 760 mm (29.92 inches) of mercury and temperature of 20 °C (68 °F).

(3) The tests in paragraph (b) of this section must be completed before doing the tests in paragraph (d) of this section.

(4) In each test that specifies inflation by an automatic inflation mechanism and either or both of the other mechanisms, the automatic inflation mechanism must be tested first.

(5) Some tests in this section require PFD's to be tested while being worn. The number and characteristics of the test subjects must be as prescribed in section 11 of UL 1517.

(b) *Tests.* Each PFD design must be tested according to the procedures in the following tests and meet the requirements in those tests:

(1) *Donning and Operability*, UL 1517, section 12.

(2) *Jump Test*, UL 1517, section 13.

(3) *Flotation Stability and Inflation*.

(i) *Uninflated Flotation Stability*, UL 1517, section 14.

NOTE: If the freeboard of a test subject is close to zero, caution must be taken to prevent the subject from inhaling water. The subject may use lightweight breathing aids to avoid inhaling water.

(ii) *Inflation*, UL 1517, section 14.3 through 14.5 using a PFD with each automatic inflation mechanism disabled.

(iii) *Inflated flotation stability*, UL 1517, section 15, for Type II and Type III performance except comparisons are to be made to the appropriate size and Type reference vest as defined in §160.077–2(j).

(4) *Water Emergence*, UL 1517, section 16.

(5) *Operation Force Test*, UL 1517, section 17.

(6) *Buoyancy, buoyancy distribution, and inflation medium retention test*, UL 1517, sections 18 and 19, except:

(i) Recreational hybrid inflatables must provide minimum buoyancy as specified in Table 160.077–15(b)(13):

(ii) The buoyancy and volume displacement of kapok buoyant inserts must be tested in accordance with the procedures prescribed in §160.047–4(c)(4) and §160.047–5(e)(1) in lieu of the procedures in UL 1517, section 18 and 19.

(7) *Inflation Chamber Tests.*

(i) *Over-pressure Test*, UL 1517, section 28.

(ii) *Air Retention Test*, UL 1517, section 29.

(8) *Temperature Cycling Tests*, UL 1517, section 23.

(9) *Solvent Exposure Test*, UL 1517, section 24.

(10) *Environmental Tests*, UL 1517, section 31.1.

(i) *Humidity Exposure*, UL 1517, section 31.4.

(ii) *Rain Exposure*, UL 1517, section 31.2 and 31.3.

(11) *Abrasion/Compression Test*, UL 1517, section 26.

(12) *Water Entrapment Test*, UL 1517, section 20.

(13) *Tensile Tests*, UL 1517, section 22.

(14) *Strength of Attachment of Inflation Mechanism*, UL 1517, section 30.

(15) *Flame Exposure Test*, UL 1517, section 25.

(16) *Impact Test*, UL 1517, section 21.

(17) *Seam Strength Test*, UL 1517, section 33.

(18) *Puncture Test*, UL 1517, section 27.

(c) *Visual Examination.* One complete PFD must be visually examined for compliance with the requirements of §160.077–15.

(d) *Inflation Chamber Properties*—(1) *General.* The tests in this paragraph must be run if the tests in paragraph (b) of this section are successfully completed. The results of these tests will be used to check the quality of incoming PFD components and the production process. Test samples must come from one of more PFD's that were each used in all of the tests in paragraphs (b)(2), (b)(6), (b)(7), (b)(16), and (b)(18) of this section.

(2) *Grab breaking strength.* Grab breaking strength of chamber materials must be determined according to Method No. 5100 of Federal Test Method Standard 191, or ASTM D 751 (incorporated by reference, see §160.077–5).

(3) *Tear strength.* Tear strength of chamber materials must be determined according to Method No. 5132 or 5134 of Federal Test Method Standard 191, or ASTM D 751 (incorporated by reference, see §160.077–5).

(4) *Permeability.* The permeability of chamber materials must be determined according to ASTM D 1434 (incorporated by reference, see §160.077–5) using CO_2 as the test gas.

(5) *Seam strength.* The seam strength of the seams in each inflation chamber of at least one PFD must be determined according to ASTM D 751 (incorporated by reference, see §160.077–5), except that 25 mm by 200 mm (1 in. by 8 in.) samples may be used where insufficient length of straight seam is available.

(e) The Commandant may prescribe additional tests, if necessary, to approve unique or novel designs.

[CGD 78–174, 50 FR 33928, Aug. 22, 1985, as amended by CGD 78–174, 60 FR 2487, Jan. 9, 1995; USCG–2000–7790, 65 FR 58463, Sept. 29, 2000]

§160.077–21 Approval Testing—Type I and Commercial Hybrid PFD.

(a) *General.* This section contains commercial hybrid PFD approval tests. The provisions of §160.077–19(a) apply to each test in this section.

(b) *Tests.* Each test prescribed in §160.077–19(b), except the tests in paragraphs (b)(2), (b)(3)(i), (b)(3)(ii), and (b)(6), must be conducted and passed.

(c) *Additional tests.* Each PFD design must also be tested according to the